

Hanford Site Environmental Monitoring Plan

Section II.B. Near-Facility Environmental Monitoring

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Introduction

Near-facility environmental monitoring is an important element of the Effluent and Environmental Monitoring Program managed by Waste Management Federal Services of Hanford, Inc. and is performed by Waste Management Federal Services, Inc., Northwest Operations in accordance with U.S. Department of Energy (DOE) Order 5400.1 and quality assurance criteria specified in HNF-EP-0538-3. Hanford Site facilities and operations with potential for significant environmental impact are sampled during preoperational environmental monitoring to establish an environmental baseline upon which to design the routine near-facility environmental monitoring to be performed.

Preoperational Environmental Survey

A preoperational environmental survey is required by Chapter IV, Paragraph 3 of DOE Order 5400.1:

“An environmental study shall be conducted prior to startup of a site, facility, or process which has the potential for significant adverse environmental impact. The preoperational study should begin not less than one year, and preferably two years before startup to evaluate seasonal changes. The study shall serve to: characterize existing physical, chemical, and biological conditions that could be affected; establish background levels of radioactive and chemical components; characterize pertinent environmental and ecologic parameters; and identify potential pathways for human exposure and environmental impact as a basis for determining the nature and extent of the subsequent routine operational and emergency effluent monitoring and environmental surveillance programs. Where time and circumstance do not allow for completion of preoperational monitoring prior to startup, it shall be conducted concurrent with work on the new site, facility, or process. The preoperational study shall be consistent with NEPA compliance activities. Where appropriate, activities and documentation conducted for NEPA compliance may substitute for compliance with this requirement.”

General guidelines for conducting the preoperational environmental survey can be found in DOE/EH-0173T and DOE/LLW-13Tg, Rev. 2. Specific references for conducting the preoperational environmental survey can also be found in HNF-PRO-453 and WMNW-CM-004.

User Identification

There are five primary users of a preoperational environmental survey:

- 1) the planning and construction organization (to demonstrate compliance with DOE Order 5400.1)
- 2) the facility operating organization (to show that containment systems for stored chemicals and wastes remain adequate in compliance with DOE Order 5400.1)
- 3) the program staff (to provide adequate data for determining the need to modify the existing near-facility monitoring objectives and to determine effluent trends and environmental conditions)

- 4) the Surface Environmental Surveillance Project (managed by Pacific Northwest National Laboratory) to adjust monitoring locations if needed
- 5) legal counsel to provide input to plaintiff requests and demonstrate regulatory compliance.

Survey Design

A preoperational environmental survey is designed to monitor the media specified in DOE/EH-0173T and DOE/LLW-13Tg, Rev. 2. To assist in designing this survey, existing documents (e.g., unplanned release reports, occurrence reports, operational and site environmental reports, historical photographs, environmental impact statements, and preliminary safety analysis reports) are reviewed.

Before initiating preoperational sampling of any new or modified facility or process, a sampling and analysis plan is prepared and issued. The sampling and analysis plan contains a project description, media to be sampled, analyses to be performed, and sampling design rationale.

Once preoperational monitoring is completed and analytical data are available, the results are included in a final preoperational environmental monitoring report (e.g., WHC-SD-W058-RPT-001, WHC-SD-WM-TI-778).

Routine Near-Facility Environmental Monitoring

Facility-specific environmental monitoring is provided for the protection of the environment adjacent to nuclear facilities and waste-treatment, -storage, and -disposal sites in compliance with applicable federal, state, and local environmental regulations and requirements.

The objectives of this monitoring are to evaluate the following:

- compliance with federal, state, and local environmental radiation protection requirements and guides
- performance of radioactive waste-confinement systems
- concentration trends of radioactive materials in the environment at and adjacent to nuclear facilities and waste-disposal sites.

Specifically, near-facility environmental monitoring entails the following functions:

- monitoring all inactive, existing, and new low-level waste-disposal sites to assess both radiological and nonradiological hazards (DOE Order 5820.2A)
- determining the effectiveness of treatments and controls used to reduce effluents and emissions (DOE/EH-0173T)
- detecting and quantifying unplanned releases (DOE/EH-0173T, 40 CFR 302, WAC 173-303-145, DOE Orders 5000.3A and 5484.1)

- monitoring fugitive emissions (i.e., diffuse sources) from contaminated areas for compliance with national emission standards for hazardous air pollutants (40 CFR 61, DOE/EH-0173T), toxic air emissions (40 CFR 265, Subparts AA and B13), state operating permits (40 CFR 70), and source registration (WAC 246-247)
- monitoring all surplus facilities before decontaminating or decommissioning (DOE Order 5820.2A)
- monitoring new and existing sites, processes, and facilities to determine potential environmental impacts and releases of contaminants (DOE Order 5484.1, DOE/EH-0173T)
- monitoring and assessing environmental radioactive contamination and potential exposure to employees and the public (DOE Orders 5400.1 and 5400.5).

The primary justifications for near-facility environmental monitoring include the following:

- provide a level of assurance that the effluent and contamination controls for the various facilities and waste sites are effective
- monitor a diversity of operations, activities, and programs managed by several different organizations (accordingly, direction and integration are needed to ensure consistency, technical quality, and cost effectiveness)
- provide data to ensure safe site access.

Near-facility environmental monitoring staff are responsible for planning, directing, and executing the effective, technically sound monitoring of all media (except groundwater) and for ensuring that the regulations and requirements are satisfied. This responsibility includes establishing the basis and scope, developing the sample and survey schedules, and ensuring that the schedules and procedures are followed by the performing organizations. The staff serve as the primary contact within and outside of Hanford Site contractors in technical matters pertaining to near-facility environmental monitoring and represent Hanford Site contractors at meetings with environmental regulators regarding this type of work.

Data obtained as a result of near-facility environmental monitoring are used to identify areas of noncompliance with regard to loss of contamination control. Radiological problem reports and compliance assessment reports are the formal mechanisms for documenting instances of noncompliance. Formal tracking of noncompliance is also performed. Near-facility environmental monitoring staff are integral to the process of developing compliance schedules for the noncompliant organization, which are then closely tracked to determine their effectiveness. These activities solidify the oversight function of near-facility environmental monitoring and perform the critical function of formally identifying areas of concern regarding unacceptable environmental conditions.

A list of federal, state, and Hanford Site documents regulating activities is given in Table II.B-1.

Table II.B-1. Governing Documents

Document Number	Title
DOE Order 5400.1 Chapter III, Environmental Protection Program Plans Chapter IV, Environmental Monitoring Requirements	General Environmental Protection Program
DOE Order 5400.5 Chapter I, General, Paragraph 8, Environmental Monitoring and Surveillance	Radiation Protection of the Public and the Environment
DOE Order 5820.2A	Radioactive Waste Management
DOE Order 5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements
DOE Order 5000.3A	Occurrence Reporting and Processing of Operational Information
DOE/LLW-13Tg, Rev. 2	Low Level Waste Management Handbook Series, Environmental Monitoring for Low Level Waste Disposal Sites
DOE/EH-0173T	Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 70	State Operating Permit Programs
40 CFR 264	Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 302	Designation, Reportable Quantities, and Notification
WAC 173-303-145	Dangerous Waste Regulations (Spills and Discharges into the Environment)
WAC 246-247	Radiation Protection - Air Emissions
DOE/RL-91-50 (latest revision)	Environmental Monitoring Plan, United States Department of Energy, Richland Operations Office
HNF-PRO-453	Environmental Notification and Reporting
HNF-PRO-454	Inactive Waste Sites
HNF-PRO-455	Solid Waste Management
WMNW-CM-004	Environmental Monitoring
HNF-EP-0538-3	Near-Facility Environmental Monitoring Program Quality Assurance Project Plan

User Identification

There are five primary users of a preoperational environmental survey:

- 1) the planning and construction organization (to demonstrate compliance with DOE Order 5400.1)
- 2) the facility operating organization (to show that containment systems for stored chemicals and wastes remain adequate in compliance with DOE Order 5400.1)
- 3) the program staff (to provide adequate data for determining the need to modify the existing near-facility monitoring objectives and to determine effluent trends and environmental conditions)
- 4) the Surface Environmental Surveillance Project (managed by Pacific Northwest National Laboratory) to adjust monitoring locations if needed
- 5) legal counsel to provide input to plaintiff requests and demonstrate regulatory compliance.

Review

The scope of near-facility environmental monitoring is reviewed by management and staff at least annually to ensure that the work complies with regulations, that appropriate effluents are being monitored, and that the monitoring locations are positioned to best determine and quantify potential releases.

Design

Sampling Locations, Frequency, Media Sampled, and Parameters Monitored

Media near active/inactive facilities to be sampled include ambient air particulates, soil, surface water, sediment, and biota. Parameters routinely monitored include, as appropriate, radionuclide concentrations, radiation exposure levels, radiation dose, hazardous constituent concentrations, pH, and water temperatures. Sample types, collection and measurement frequencies, and analytes and parameters monitored are given in Table II.B-2.

Monitoring Locations

Information regarding specific sampling locations can be found in WMNW-CM-004. The criteria for establishing monitoring locations for each of the media in Table II.B-2 are as follows:

- soil - downwind and within a few meters of a source. Unless documented site-specific evidence exists to justify otherwise, the sample(s) will be collected in a location free from unusual localized effects or other conditions (i.e., near a large building, vehicular traffic, trees) that could result in artificially high or low concentrations.

Table II.B-2. Near-Field Sampling Media, Frequency, Analytes, and Parameters

Sample Types	Collection or Measurement Frequency	Analytes/Parameters Monitored
Air	Biweekly Semiannual	Total alpha and beta Strontium, plutonium, uranium, gamma
Soil	Annual	Strontium, plutonium, uranium, gamma
Vegetation	Annual	Strontium, plutonium, uranium, gamma
Animals	Annual	Strontium, plutonium, uranium, gamma
Thermoluminescent dosimeter	Quarterly	Radiation dose
Survey points	Annual	Radiation dose
Surface water	Weekly Monthly	pH Total alpha, beta, strontium, gamma
River seepage	Annual	Strontium, gamma, tritium
Sediment	Annual	Strontium, plutonium, uranium, gamma
Aquatic vegetation	Annual	Strontium, plutonium, uranium, gamma

- vegetation - on or near sites and/or facilities with the potential for biological intrusion
- animals - on or near sites and/or facilities with the potential for biological intrusion. Animals are sampled opportunistically.
- surface water, sediment, and aquatic vegetation - at ponds or ditches used for disposal of, or potentially impacted by, liquid effluents from operating facilities
- background dose rate - at or near facilities that may cause elevated dose rates, including active/inactive sites, access areas, waste-handling facilities, effluent-discharge points, and other suspected pathways for radiation exposure
- radiation surveys - at inactive waste sites; outdoor radiological control areas; tank farm perimeters and associated diversion boxes, lift stations, and vent stations; perimeters of active or uncovered waste sites (e.g., retention basins, ponds, process trenches, ditches); and road and rail surfaces.

Sampling Frequency

A routine near-facility environmental monitoring schedule is developed, reviewed, and approved by Waste Management Federal Services, Inc., Northwest Operations, Waste Management Federal Services of Hanford, Inc., Fluor Daniel Hanford, Inc., and Bechtel Hanford, Inc. The near-facility environmental monitoring staff reviews the radiological survey reports and files a copy for historical purposes and reference. Radiological conditions are tracked and trends are noted. The survey frequencies for particular

sites are based on site history, radiological conditions, and general maintenance. All sites are surveyed at least once each year. Special surveys may be conducted at irregular frequencies if conditions warrant (e.g., growth of deep-rooted vegetation is noted at a waste site). Radiological surveys are conducted to detect surface contamination and to document changes in vegetation growth, biological intrusion, erosion, and general site-maintenance conditions. Survey data are compared with standards identified in HNF-PRO-453, HNF-PRO-454, and HNF-PRO-455, as well as previous surveys to recognize possible trends, to assess environmental impacts, and to help determine where corrective actions are needed.

Sampling Methods

Sampling methods are reviewed to determine equipment efficiency and to comply with current federal (U.S. Environmental Protection Agency) and industry (American National Standards Institute, American Society for Testing and Materials) standards. The following sampling methods are routinely used for near-facility environmental monitoring:

- ambient air - air-sampling stations collect samples at a height of 2 m above ground level and use a vacuum pump to provide air flow of 2 ft³/min. A timer and flow-rate meter are used to determine time and flow of the sampler. Samples are collected biweekly to prevent dust loading on the sample filter.
- soil - soil-sampling equipment may be one of three types: 1) a garden spade, 2) a core sampler (split spoon) for special soil sampling, or 3) a plug (“cookie cutter”) sampler for routine samples. All equipment is easily decontaminated or is disposable. Samples are placed in a sealable plastic bag or other suitable container and, if necessary, into an appropriate container for shipment.
- vegetation - vegetation-sampling equipment consists of pruning shears, loppers, saws, core drill, or machete. Samples are cut to length, placed in a plastic bag, and, if necessary, into an appropriate container for shipment.
- animals - animal samples are usually collected by pest control staff. The animals are checked for radioactive contamination by radiation control staff; those animals found to be contaminated may be kept for analysis. The samples are put in a plastic bag and, if necessary, into an appropriate container for shipment.
- surface water - surface water-collection equipment consists of a clean cup (~1 L) attached to the end of a sampling pole. The sample is taken at the designated sampling location by dipping the sampling cup into the surface water (being careful not to disturb the sediments). The sample is then poured into a larger sample container, and the process repeated until the sample container is full. One additional full cup of sample is then taken from the surface water, and a field pH reading is taken. This sample is then returned to the surface water.
- sediment - sediment samples are collected using two methods:
 - a soil core sampler equipped with a sample liner. The core sampler is forced into the sediment to a depth of 30 cm. The liner is withdrawn from the sampler, and the retained sediment is placed into a watertight plastic jar, sealed, and labeled appropriately for delivery to the designated laboratory for analyses.
 - a flat-bladed shovel and “cookie cutter”/spatula-type sampler. The sample is collected by skimming an approximate 2.54-cm-deep portion of sediment into the shovel and removing it carefully from the water. The cookie cutter is forced into the sediment. Excess sediment is removed by

scraping it away with the spatula. The spatula is then carefully placed under the cookie cutter, trapping the sample. The sample is placed in a watertight plastic jar, sealed, and labeled appropriately for delivery to the designated laboratory for analyses.

- aquatic vegetation - aquatic vegetation samples are collected using various tools (e.g., shears, pruners, loppers). Vegetation is collected either directly from the water source or bank in 500-g samples and placed in a plastic bag. The sample is double bagged and labeled appropriately for delivery to the designated laboratory for analyses.
- background dose rates - background dose rates are taken by two methods: thermoluminescent dosimeters (TLDs) and micro-rem meters. The TLDs consist of four lithium fluoride (TLD-700) and one calcium fluoride dysprosium (TLD-200) chips in a plastic card supplied by Pacific Northwest National Laboratory. Three TLDs are placed at each sampling location on a post at 1 m from the surface. Micro-rem meters are used to measure relative background dose rates.
- radiation surveys - radiation surveys include road/railroad surfaces, cribs, stabilized burial grounds, covered ponds and ditches, tank farm perimeters, active burial ground perimeters, unplanned release sites, and other radiation areas.

Road surveys are performed with a mobile surface contamination monitor or a vehicle equipped with sodium iodide detectors or plastic scintillators. Railroad surveys are conducted with a vehicle equipped with sodium iodide detectors and "high railers," which allow the vehicle to travel both on the roads or railroads. The detector height is adjustable in all cases, and the average survey height is 0.3 m (1 ft). When activity is detected, the vehicle is stopped and a thorough survey is made with an Eberline Model BNW-1 portable survey instrument equipped with a P-11 probe to identify the extent of the contamination.

Surveys at waste sites and other radiation areas may be conducted with vehicles equipped with radiation detection instruments or with hand-held field instruments. Wherever possible, smear surveys are made on the surface of exposed equipment within a radiation area. Vegetation, animal burrows, and animal feces are also monitored to detect biological transport. Detailed survey practices and procedures are described in WMNW-CM-004, HNF-CM-1-6, HSRCM-1, and HNF-IP-0718.

Parameters Monitored

The parameters to be monitored for each medium vary and may include the following:

- ambient air - isotopic or total gamma, strontium, plutonium, uranium, and tritium at selected locations
- soil - isotopic or total gamma, strontium, plutonium, and uranium
- vegetation - isotopic or total gamma, strontium, plutonium, and uranium
- animals - isotopic or total gamma, strontium, plutonium, and uranium
- surface water, sediment, and aquatic vegetation - isotopic or total gamma, strontium, tritium, plutonium, uranium, nitrates, and pH
- background dose rate - measured in the area where samples are taken to identify any increasing or decreasing trends in background radiation that may affect the environment, the workers, or the public

- radiation surveys - performed to measure the surface and background radiation in the area in which the measurement is taken.

Samples are typically analyzed for the constituents listed in facility effluent monitoring plans for the facility of concern (see Section II.A). Best professional judgment is used to locate initial sampling sites to monitor the near-facility environment.

References

40 CFR 61, Code of Federal Regulations, Title 40, Part 61. *National Emission Standards for Hazardous Air Pollutants*.

40 CFR 70, Code of Federal Regulations, Title 40, Part 70. *State Operating Permit Programs*.

40 CFR 264, Code of Federal Regulations, Title 40, Part 264. *Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*.

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DOE Order 5000.3A. "Occurrence Reporting and Processing of Operational Information."

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DOE Order 5400.5. "Radiation Protection of the Public and the Environment."

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WMNW-CM-004. 1997. *Environmental Monitoring*. Waste Management Federal Services, Inc., Northwest Operations, Richland, Washington.